

aim, being fairly easily conducted, and at the same time definite and trustworthy in their results.

The principal chemical differences between metals and non-metals are illustrated by experiments on hydrogen and oxygen; the meaning of the terms "acid," "base," "salt," &c., are clearly demonstrated by experimental evidence. The clearness of the enunciation of the fundamental assumptions of the modern atomic theory; the method, experimentally illustrated, of determining molecular and atomic weights; the experimental proof of the splitting of elementary molecules in chemical changes; the method of determining the atomic heat of a metal; the proof of the gaseous laws; the determination of the volume of unit weight of hydrogen, and the application of this determination to the calculation of the weights of gaseous volumes generally; these and other experiments and deductions are all admirably described.

The author is certainly to be congratulated on the production of this book; the care and trouble bestowed on it are doubtless not to be measured by the small number of pages which it contains; the result is most satisfactory. No better guide to the study of chemical science could be placed in the hands of the beginner than this modest little volume of Prof. Reynolds'. M. M. P. M.

### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### Barometric and Solar Cycles

I SEE that Prof. Hill regards the barometric evidence as favourable to the hypothesis that the sun is most powerful when there are fewest spots on his surface. Perhaps I may therefore be allowed to state the reasons which have induced me to entertain a contrary opinion, which are, I imagine, the same as have also occurred to others. I quite agree with Prof. Hill that the true relation between the variations of sun-spot area and barometric pressure will ultimately be discovered by means of the admirable weather-maps of the United States. Nevertheless, we must wait until these have been produced in sufficient number before we attempt to generalise.

I do not think therefore that Prof. Hill is warranted in drawing any conclusion from a single map, however important, such as that for July, 1878—a time of minimum sun-spots.

Referring to your article (NATURE, vol. xxi. p. 567), I find the evidence from this map to be summarised as follows:—

"It may be worth remarking that this increased pressure over the oceans and diminished pressure over the land of the northern hemisphere is in accordance with what might be expected to result from an increased solar radiation; whilst on the other hand the increased pressure over Southern and Central Asia, and diminished pressure in the southern hemisphere, is not in direct accordance with this supposition."

It thus appears that this evidence is after all of a very mixed nature.

Regarding the unequal distribution of barometric pressure as without doubt caused by the sun, we may with much justice imagine that whenever the sun is most powerful these peculiarities of distribution will be greatest and most apparent. If we now look at a map of isobaric lines (Buchan, "Handy Book of Meteorology") we shall find that the Indo-Malayan region is one that for the mean of the year has a barometric pressure probably below the average. Now during years of powerful solar action we should imagine that this peculiarity would be increased. But this is precisely what all the Indian observers have found for years with most sun-spots. On the other hand, Western Siberia in the winter season has a pressure decidedly above the average, and we should therefore imagine that during years of powerful solar action the winter pressure in Western Siberia would be particularly high. This again is the state of things that Mr. Blanford has found in his discussion of the

Russian stations (NATURE, vol. xxi. p. 479) to correspond with years of most sun-spots.

It therefore appears that the barometric evidence, as far as it goes, is favourable to the belief that years of maximum sun-spots are years of greatest solar power. BALFOUR STEWART

#### Bi-Centenary of Calderon

I AM requested by H. E. Don A. Aguilar, Secretary-General of the Royal Academy of Science of Madrid, to beg you will have the goodness to insert in your journal the inclosed notice from that body, offering a prize for an essay on the works of Calderon de la Barca. I am aware that the other Academies (History and Spanish) have already offered prizes for similar works, but this being intimately associated with science, the Academy in that branch has thought it desirable to offer a separate and special one.

I trust I may count on your kind hospitality for a foreign colleague if not trespassing too far on your valuable space.

F. J. RICARDE-SEAUER

Conservative Club, St. James Street, S.W., March 11

#### ROYAL ACADEMY OF SCIENCE, MADRID.

*Programme (adopted by the Council) for the adjudication of a Prize in Commemoration of the Bi-centenary of Calderon de la Barca, 1681, May 25, 1881.*

The Royal Academy of Science of Madrid being desirous amongst others of commemorating the bi-centenary of the great Spanish dramatic poet Don Pedro Calderon de la Barca, offers a prize for public competition on the following theme:—

"The conception of Nature and her laws deducible from the works of Calderon, as the expression of the standard of scientific knowledge amongst individuals at that period who, without specially professing science, excelled in the cultivation of letters. An analysis of the works of contemporary poets in support of their theme being optional with competitors."

#### Conditions.

Article 1.—The author of the successful essay will receive a prize consisting of a bronze medal with the legend of the Royal Academy of Science and the sum of 500 pesetas (20*l.*), as also 200 copies of the prize essay printed and bound at the cost of the Academy.

Article 2.—The competition shall remain open from this date up to the 10th May next.

Article 3.—The essays must be written in Spanish or Latin.

Article 4.—These must be delivered or forwarded to the Secretary of the Academy (H. E. Don A. Aguilar, 2, Plaza de la Villa, Madrid) before the above date, with a distinctive endorsement on the outer cover, so as to be easily recognised, but without further notes or indication whatever.

Accompanying the essay the author must transmit a sealed letter bearing the same endorsement as the essay itself, and containing *inside* the name and address of the author.

Further conditions may be learned from

A. AGUILAR, Secretary-General

2, Plaza de la Villa, Madrid, February 12

#### The Photophone

THREE years ago, whilst experimenting on the action of radiant heat and light on the electrical resistance of substances, I was induced to believe that coating selenium with varnish or lamp-black would largely increase its sensibility to light. I therefore annealed a stick of selenium about 2 cm. in length and 5 cm. in diameter, having previously melted into each end a platinum wire, and thus obtained a specimen which, though of very high resistance, was exceedingly sensitive to the action of light. The effect of diffused daylight was tested in the following manner:—The specimen was placed in a glass box and connected directly with two Leclanché cells and a very delicate Thomson's galvanometer having a resistance of 6000 ohms; a deflection of, as far as I now remember, about 300 divisions of the scale was produced, and the light was then brought to zero by means of the adjusting magnet; a dark blind which had previously been drawn down was now pulled up, and the result was a deflection of about 100 divisions in the same direction as before. The glass box was placed three yards in front and a little to one side of the window, which was closed, and the sun at the time (about 4 p.m. July, 1877) was on the other side of the house. The

selenium was then coated with shell-lac varnish, and about two hours afterwards again tested in the same manner as before, when the light was found to produce a deflection of 220 divisions, or more than twice the previous amount. The action of radiant heat was similar to that of light in the case of this particular specimen, but I have little doubt that *any* specimen may be rendered more sensitive to light by coating it with varnish or lampblack. I hope that this suggestion will prove of service to those philosophers who may aspire to "hear a beam of light" or to "see by electricity," and shall be glad to hear that such has been the case.

HERBERT TOMLINSON

King's College, Strand, March 7

### Cave Animals and Multiple Centres of Species

THE readers of Seaper's "Existenzbedingungen der Thiere," now translated into English, will find (vol. ii. p. 268 of the German edition) an interesting discussion on the question of monophyletic or polyphyletic evolution of species, the author decidedly inclining to the latter hypothesis. Considering that at the root of the manifold and difficult problems here involved, there is the relatively simple one of single or multiple centres of each species in a biographical sense, I take leave to ask the following question, hoping for an answer from among your readers versed in these matters.

To me it seems impossible to maintain the single centres of species in a strict and definite sense without also maintaining the single progenitor of each species, which latter view, formerly considered as a necessary assumption, has been given up by Mr. Darwin in Chapter IV. of the later editions of the "Origin of Species" (5th ed. p. 103, 104). Of course the acceptance of single centres, in the sense of more or less restricted areas of origination, may remain valid for the vast majority of species—but this is very different from considering it, once for all, as "a necessary consequence of the adoption of Darwinian views," as has been formerly said by Mr. Bentham (NATURE, vol. ii. p. 112).

Now, I have sometimes thought that there might be a test for the possibility of multiple centres, which, eventually, would amount almost to an experimental demonstration—namely: *whether there are cases of the same species of blind animals occurring in different caves distant from and without subterranean communication with each other?* Should such cases occur it would be most improbable that the animals in question had been transported from one cave to the other in the modified state, and most probable that they had been independently evolved in each cave from identical species which entered it from without. I formerly noted one instance perhaps in point, viz. a statement of Prof. Cope's (NATURE, vol. vii. p. 11) that "the blind fish of the Wyandotte Cave is the same as that of the Mammoth, the *Amblyopsis spelaeus*, Dkay," but I am not aware whether subterranean communication is, or has been, impossible in this instance. Perhaps more decisive cases have become known of late?

Freilburg im Breisgau, March 4

D. WETTERHAN

### Prehistoric Europe

WILL you kindly allow me to correct a clerical error in my letter which appeared in NATURE, vol. xxiii. p. 433. For "hash-up" of the species, read "hash-up" of species. A number of the species from the Upper or Interglacial Bone-bed of Mont Perrier (and some of which are mentioned in my letter) are of course too characteristically Pleistocene to be claimed by Prof. Dawkins as Pliocene forms, and do not therefore appear in his list of Upper Pliocene species to which I referred.

Perth, March 14

JAMES GEIKIE

### Measuring the Height of Clouds

IN NATURE, vol. xxiii. p. 244, Mr. Edwin Clark gives a method whereby the height or distance of clouds may be measured. This end has already been attained by me, several years ago, and I believe with adequate success. I have also worked out the method in detail, so that its practical realisation no longer offers any difficulty. It is very simple and easy, and the apparatus ("nephoscope") is not difficult to make. A full description of the nephoscope will be found in the *Zeitschrift der Oesterreich. Ges. für Meteorologie*, edited by Jelinek and Hann, vol. ii. p. 337, in so far as the instrument serves for measuring the direction and velocity of the passage of clouds. In order also to ascertain the absolute height of clouds (N.B. all without calcula-

tion) I have introduced an improvement. This and a guide to practical use I have published in the same *Zeitschrift* (vol. ix. September, 1874, pp. 257-61). I believe Mr. Edwin Clark will find in the article referred to his idea fully worked out.

C. BRAUN,

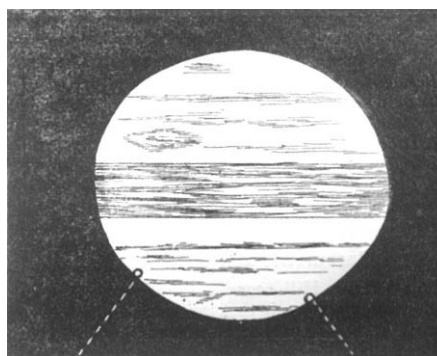
Kalocsa, Hungary, March 3 Director of the Observatory

### Occultation of 73 Piscium

I OBSERVED here this evening the occultation of 73 Piscium by Jupiter, which was predicted in your "Astronomical Column" under the date December 23, 1880 (NATURE, vol. xxiii. p. 183). At 1h. 52m. 30s. G.M.T. the star was hanging on the limb of the planet, and by 1h. 54m. it had entirely disappeared.

The phenomenon strongly resembled the occultation of a satellite, except that the disappearance was more rapid. But it was not instantaneous as I had expected. The planet and star appeared to cohere for about one and a half minute. The contrast in their colours was very marked, Jupiter appearing of a yellowish tinge, while the star shone out white like a diamond. During the occultation the red spot was on the planet's disk, and its following end was in about the same meridian as the point of the star's occultation.

I had no micrometer, but I inclose a diagram showing the estimated points of occultation and reappearance.



Point of disappearance

Point of reappearance

The G.M.T. of reappearance was 2h. 44m., when the star was again observed to hang on to the planet's limb.

The telescope used was a  $4\frac{1}{2}$  inch refractor by Cooke equatorially mounted, with a power of 96.

The planet was well placed for observation, being nearly in the zenith.

Before and after the occultation Jupiter appeared as if with five moons, the star being almost indistinguishable from the satellites.

As the occultation could not be observed in Europe these few notes may possibly prove of some interest.

A diagonal (prism) eyepiece was used in making the sketch.

Meean Meer, Lahore, February 3

H. COLLETT

### Colours of British Butterflies

MOST of the protectively coloured British butterflies pair either on the ground as the "Blues," or on low herbage as the majority, or on the leaves of trees, as some of the "Hair-streaks," and with closed wings. The wings of both sexes are usually opened as widely as possible immediately before copulation.

I have been struck by the fact, which I may mention in reference to the remark of Mr. J. Innes Rogers (NATURE, vol. xxiii. p. 435), that I have never seen the "peacock" attacked by any British bird, and I have often watched him flaunting his colours in the presence of shrike, flycatchers, and other—one would imagine dangerous—company.

W. CLEMENT LEY

Ashby Parva, Lutterworth, March 11

### Lecture Representation of the Aurora Borealis

I HAVE recently employed a simple device for giving to an audience a vivid idea of an aurora, and that has been to paint a